ADVANCED BIOLOGICAL SYSTEMS
Unit #1: Evolution
Instructional resource #1: History of Life

Instructors' notes
From the perspective of a biologist, the history of life on the Earth is a recurring story. Although details may be different, what happens today has precedence in the occurrences of the past. Two underlying ideas are vital for students to understand a modern conception of the theory of evolution. First, over long periods of time, and due to natural events, the environment of the Earth has changed, sometimes dramatically. Second, each environmental change has created more favorable conditions for some species to live and reproduce, while producing less favorable conditions for others. This first lesson in our unit on biological evolution addresses these two conditions explicitly.

Students choose to research a particular era of the history of our planet. They present their findings through a PowerPoint slide show. Through these slide shows, presented to the class in their order through time, students see an ever changing planet. Geographical, climatological, and biological qualities of each era are highlighted. On display through these presentations is an obvious connection of changing atmospheric carbon dioxide levels to extinction events.

As an added benefit to the instructor, this lesson provides an early opportunity to assess students' ability to productively research into a topic, as well as effectively communicate complex ideas to their peers.

NGSS addressed in this lesson:	
HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
HS-LS2-6	Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

History of Life

In the ABS course this semester, we will collectively explore the history of life on Earth and changes through the current era. We will accomplish this by assigning each group of students a particular geological time period or epoch to investigate. Each group will be responsible for providing information on the following with respect to their assigned time period or epoch.

- Approximately when did your time period or epoch begin and end (in millions of years before present)?
- What were the positions of the continents during your time period or epoch?
- What, if anything, can you tell about the prevailing climate(s) and atmospheric conditions during your time period or epoch?
- What are the major geological characteristics (presence of iron, etc in soil) or physical events (volcanic eruption) that mark or occurred during your time period or epoch?
- Incorporate information related to Luca as appropriate to your time period (refer to Chapter 8 and throughout the Oxygen book)

  … and <u>most</u> <u>importantly</u> …

- What kinds of organisms lived during your time period or epoch? More specifically, what are some examples of autotrophs (e.g., plants and algae) and heterotrophs (e.g., fungi and animals)? Be careful to also mention organisms or taxonomic groups that first appeared or went extinct during your time period or epoch. If you have an extinction in your time period, that should be of major focus as well.

Specifically, how do the first five characteristics listed directly or indirectly impact the biodiversity of the era?

In addition to the above listed items, share information on the evidence from the book Oxygen (Nick Lane) as well as other sources in terms of how they drew conclusions about these historical eras.

Information on each time period or epoch should be shared in the form of a short PowerPoint presentation. This presentation should consist of a combination of text (bullet point) and pictures. The purpose of this activity is not to exhaustively cover each time period or epoch, but rather to give a snapshot of each.

Limit your presentation to approximately 20 minutes total. We'll reserve some time after for questions.

Make sure you include a slide at the end of your presentation that lists the sources used to gather information.

Geological Time Scale

Source: http://www.ucmp.berkeley.edu/help/timeform.php

Sign-up here

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